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Changes in the Number and Cost of Motor Vehicle Injury Victims in Ontario

Following the Introduction of
Seat Belt Legislation and Highway Speed Limit Reductions, 1975-1976.



Monitoring System Committee
Ministry of Transportation and Communications
Ministry of Health



CHANGES IN THE NUMBER AND COST
OF MOTOR VEHICLE INJURY VICTIMS IN ONTARIO
FOLLOWING THE INTRODUCTION OF SEAT BELT LEGISLATION
AND HIGHWAY SPEED LIMIT REDUCTIONS
1975-1976

Monitoring System Committee
Ministry of Health
Ministry of Transportation & Communications

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1. INTRODUCTION

This report of the Monitoring System Committee describes changes in the number of hospitalized motor vehicle injury victims and their respective cost of hospital and medical treatment in Ontario. Comparative statistics are presented for the year 1975, the period before, and the year 1976, the period after the compulsory seat belt legislation and the reduced highway speed limits were introduced. The report is based on information obtained for the 14,859 victims of motor vehicle accidents that occurred in 6 selected counties/districts in Ontario during 1975 and 1976, and the victims were treated in the 16 selected hospitals located in these counties/districts. The 14,859 study victims represents 8.2 percent of all victims of motor vehicle accidents in the Province in 1975 and 1976.

This final report is similar in format to the interim report that covered the first three months of 1975 and 1976. It describes changes in the numbers of victims, components of health care cost, types and severity of injury, length of hospital treatment and other variables captured on the survey form. Due to the limitations in data and resources, the cost of health care for the victims has been narrowed to the level of active treatment care only. This care consists of active hospital, medical and therapy treatment, and it is exclusive of ambulance, chronic, rehabilitation and other forms of post-active care.

The changes in the volume of injuries and the cost of defined treatment between 1975 and 1976 are ascertained for the selected hospitals in six counties and districts in Ontario. The selected study findings are also projected, in the report, to the provincial total of hospitalized

injuries and their respective cost of treatment. In addition to this report, computerized SPSS (Statistical Package for the Social Sciences) system files have been set up for in depth analytical examinations and specific data retrieval as may be required by the researcher. Analytical relations among the study findings, and between the study findings and other related factors can be measured and evaluated by using the system files.

2. PROVINCIAL SUMMARY

The findings in this section refer to the number of motor vehicle accident injury (MVAI) victims in Ontario and their estimated cost of active treatment care. The cost of active treatment care is defined as the sum of out-patient hospital emergency treatment, acute in-patient hospital care, and cost of medical and therapy treatment. Comparisons are made between the year 1975 and the year 1976, when the compulsory seat belt legislation and the reduced highway speed limits were introduced. The changes in the cost of active treatment care are observed in constant 1975 rates. The amounts of total costs are rounded where appropriate. Highlight items 1) and 2) are based on the Ministry of Transportation and Communications statistics, items 3)-13) are projected data from the study findings.

- 1) Number of persons killed in motor vehicle accidents decreased by 16.1 percent, down from 1,800 to 1,511.
- 2) Number of persons injured (hospitalized as well as non-hospitalized victims) decreased by 13.7 percent, down from 97,034 to 83,736.
- 3) Number of hospitalized victims (in-patients and out-patients) decreased by 16.1 percent, down from 53,923 to 45,242.
- 4) Number of in-patient victims decreased by 21.6 percent, down from 11,018 to 8,635.
- 5) Number of out-patient victims decreased by 14.7 percent, down from 42,905 to 36,607.
- 6) Cost of active treatment care for hospitalized victims (in-patients and out-patients) declined by 10.7 percent, down from approximately \$18,280,000 to \$16,332,000.
- 7) Hospital in-patient care accounted for the largest amount of expenditure of approximately \$14,506,000 and \$13,078,000 in 1975 and 1976. This amounts to a reduction of 9.8 percent.

- 8) Medical fees accounted for the second largest amount of expenditure of approximately \$2,856,000 and \$2,476,000 in 1975 and 1976.
- 9) Overall reduction in the severity of hospitalized injuries was observed. The minor injuries declined by 13.0 percent, moderate to maximum injuries were reduced by 14.5 percent.
- 10) Number of acute hospital patient-days generated by the victims declined from 127,423 to 111,088, a reduction of 12.8 percent.
- 11) Average length of acute hospital stay for the in-patient victims increased from 11.6 days to 12.9 days.
- 12) Average cost of active treatment care per hospitalized victim increased by 6.5 percent, up from \$339 to \$361, chiefly on account of increased length of hospital stay.
- 13) In 1976, the average cost of active treatment for victims who reported use of seat belts was \$228. "Inside the vehicle" victims who reported otherwise incurred an average cost of active treatment of \$419. Other victims, such as pedestrians and cyclists (cyclist includes bicyclist, moped and motorcycle driver and passenger) incurred an average cost of \$693 and \$498 respectively.

3. MONITORING SYSTEM COMMITTEE

In a memorandum dated December 1, 1975 Mr. E. E. Stewart, Deputy Minister, Office of the Premier, indicated the importance of a monitoring system which would provide an accurate record of the results of the compulsory seat belt legislation and the lowered highway speed limits in Ontario. The memorandum was addressed to Mr. H. F. Gilbert, Deputy Minister, Ministry of Transportation and Communications and to Mr. S. W. Martin, Deputy Minister, Ministry of Health. Copies of the memorandum were forwarded to Hon. James Snow, Hon. Frank Miller and Hon. Roy McMurtry.

Following the above communication from the Premier's Office, the Ministry of Health and the Ministry of Transportation and Communications undertook to organize a monitoring system to capture changes in number of motor vehicle injuries and their respective cost of treatment in the Province of Ontario. This led to the establishment of the Monitoring System Committee responsible for development and production of the information required. The Committee is composed of the following membership:

R. Waterhouse (Chairman)	- Ministry of Health
J. Vila (Principal Investigator)	- Ministry of Health
M. Valliant	- Ministry of Health
A. Felice	- Ministry of Health
A. Ross	- Ministry of Health
A. Cunliffe	- Ministry of Transportation and Communications
R. Slocum	- Ministry of Transportation and Communications
J. Pierce	- Ministry of Transportation and Communications

4. TERMS OF REFERENCE

The objectives of the monitoring system are to measure and describe:

- 1) changes in the volume of motor vehicle accident injuries between 1975 and 1976;
- 2) changes in the cost of treatment of motor vehicle accident injuries between 1975 and 1976.

The above changes are to be ascertained for the selected counties and districts in the Province of Ontario, subject to provincial projections.

5. OVERVIEW OF LEGISLATIVE CHANGES

5.1. Seat Belts

On January 1st of 1976 the Province of Ontario became the first major North American jurisdiction to enact legislation requiring seat belt use in motor vehicles. The legislation made the wearing of seat belts mandatory for all drivers and passengers except 1) infants, 2) those with medical problems, and 3) those whose work required them to get in and out of the motor vehicle at frequent intervals and whose vehicle would not travel at a speed exceeding 25 miles per hour. Enforcement of the law began February 1, 1976. The original law required the use of shoulder belts if they were fitted. An amendment effective February 27 changed that requirement. As the law now stands, shoulder belts are required to be worn only when the car was manufactured on or after January 1, 1974 when inseparable three point belts became required equipment under the Motor Vehicle Safety Act of Canada.

5.2. Seat Belts Usage

Before introducing the legislation, the Province had launched a \$650,000 information programme to persuade motorists to wear seat belts voluntarily. Due to the campaign there were positive changes in public knowledge and attitudes towards seat belts but the belt use remained virtually unchanged at 17.2 percent, according to the Ontario Ministry of Transportation and Communications (MTC) surveys. Following the legislation, belt use province-wide increased dramatically. In March 1976 it stood at 76.8 percent. However, by the middle of 1976, belt use dropped to about 65 percent, and by November/December 1976 belt use on urban and rural roads had decreased to 50 percent, according to MTC survey.

Survey Period	Seat Belt Usage in Ontario	
	Urban and Rural Roads	Expressways
October 1975*	17.2%	38.1%
March 1976	76.8%	76.3%
November/December 1976	50.0%	44.4%
May 1977	48.9%	54.0% & 47.5%**

*Prior to seat belt legislation.

**54 percent refers to roadside interview survey;
47.5 percent refers to observational type of survey.

Source: Ministry of Transportation and Communications

Belt use on expressways rose significantly but not as dramatically as belt use on other roads. In October 1975, belt use on expressways had been 38.1 percent and, following the legislation, it rose to 76.3 percent which was approximately the overall usage rate at that time. By November/December 1976, it had dropped to 44.4 percent, only 6.3 percent above the pre-legislation level.

A seat belt usage survey carried out by MTC in May 1977 indicates belt use at 48.9 percent province-wide on urban and rural roads. Belt use on expressways in May 1977 was estimated between 47.5 to 54.0 percent. It appears that seat belt usage on roads and on expressways is stabilizing in the 50 percent range.

5.3. Speed Limits

In addition to the seat belt legislation the government of Ontario reduced highway speed limits in February of 1976. All highway limits previously posted at 70 mph (112 km/h) were changed to 60 mph (96 km/h) and most, previously posted at

60 mph (96 km/h), were lowered to 50 mph (80 km/h). Certain sections of some highways were excepted in that they were changed from 60 to 55 mph (88 km/h) or remained unchanged due to special considerations. The primary purpose for the lower highway speed limits was to reduce provincial motor vehicle fuel consumption. Secondly, based on experience in the United States, the lower speed limits in Ontario were also expected to produce further reductions in highway fatalities and injuries.

5.4. Effects on Operating Speeds

Changes in the average operating speeds, following the speed limit reductions in February 1976, are illustrated in tabular form. Data are based on highway speed surveys carried out by the Ministry of Transportation and Communications.

Reduction in Speed Limits February 1976	Average Operating Speed Changes as Measured in May 1976
10 mph (70 mph to 60 mph)	- 5.6 mph
10 mph (60 mph to 50 mph)	- 4.1 mph
5 mph (60 mph to 55 mph or 55 mph to 50 mph)	- 2.8 mph
Limits unchanged	- 0.7 mph

Source: Ministry of Transportation and Communications
"Reduced Speed Limits in Ontario", 1977

Operating speeds have not changed substantially since May 1976. According to the MTC survey in May 1977, average speeds increased only by 0.4 mph (0.6 km/h) since May 1976.

Two other important aspects of reduced highway speed limits were measured in the MTC Surveys. These were 1) compliance with the speed limits and 2) distribution of operating speeds. The findings in May 1976 indicated that overall compliance with the speed limits dropped from 57.4 percent (period before February 1976) to 45.8 percent (in May 1976). However, the percentage of drivers exceeding the speed limit by 10 mph or more decreased from 8.1 to 7.6 percent in May 1976. This aspect has safety benefits since the accidents which occur at higher speeds are comparatively more serious.

The speed distribution measured as speed variability in the "pace" indicates a lower spread of speeds. This should indicate a smoother, more uniform and safer traffic flow.

6. RESEARCH DESIGN

6.1. Modus Operandi

The Monitoring System Committee developed the monitoring system through the design of a coding survey form that combined pertinent information from several existing data sources. The following sources of information were employed in creation of the system:

- 1) Motor Vehicle Collision Report. These reports are completed by the police at the scene of accident. Statistical data from the reports are published by the Ministry of Transportation and Communications.
- 2) Hospital Out-Patient Report (form 134A)
- 3) Hospital In-Patient Report on Active Treatment Care (forms 106D & S)
- 4) Hospital Out-Patient Therapy Report (form 134B)
- 5) Private Physiotherapy Report (form 151)
- 6) Medical payments by O.H.I.P.

The Motor Vehicle Collision Reports, supplied by the Ministry of Transportation and Communications for the six selected counties/districts, were used as a starting point for the victim identification. Names of the victims, date of accident and victim disposition were employed to trace the injured person into the health information system. When the victim's hospital record, either out-patient or in-patient report was found, the victim's O.H.I.P. number, diagnosis and length of active treatment hospital stay were recorded. The victim's name and O.H.I.P. number were then used for further

identification to ascertain number of therapy visits and amount of medical cost for the period of treatment.

The coding form designed by the Monitoring System Committee illustrates the sources and types of data collected. All data sources containing personal information were handled in a confidential manner. Study findings are presented in statistical form only. A copy of the form is attached in the appendix.

At the data processing stage of the study, the length of active treatment hospital stay, the volume of therapy visits and the out-patient treatment in the emergency department were converted to the respective components of health care cost. The cost conversion of the active treatment hospital stay was based on the application of the effective standard ward per diem hospital rates to the number of in-patient days the victim spent in active care. The cost of therapy and out-patient treatment in the hospital emergency department was assessed at standard rates per therapy and emergency care visit. The standard rates were obtained from the Fiscal Resources Branch of the Ministry of Health.

6.2. Selection of Study Hospitals

The selection of study hospitals is based on geographic divisions of the Province of Ontario in six health planning regions. In a process of multi-stage stratified sampling, one county or district was selected in each region, and in turn, a major hospital centre in the selected county/district was chosen.

In total, six hospital centres comprising 16 active treatment hospitals were defined for the study.

<u>County/District</u> (Hospital Centre)	<u>Study Hospital</u>
Middlesex (London)	St. Joseph's Hospital Victoria Hospital University Hospital
Waterloo (Kitchener)	Kitchener-Waterloo Hospital St. Mary's General Hospital
Peterborough (Peterborough)	Peterborough Civic Hospital St. Joseph's General Hospital
Frontenac (Kingston)	Hotel Dieu Hospital Kingston General Hospital
Sudbury District & Sudbury Regional Municipality (Sudbury)	St. Joseph's Hospital Sudbury General Hospital Sudbury Memorial Hospital Laurentian Hospital
Thunder Bay (Thunder Bay)	The General Hospital of Port Arthur St. Joseph's General Hospital McKellar General Hospital

6.3. Study Definitions

Because of limitations of data availability and resource constraints, the cost of health care for the victims of motor vehicle accidents has been narrowed to the level of active treatment care. This care consists of out-patient emergency treatment, in-patient acute hospital care, medical and therapy treatment. It is exclusive of cost of ambulance, chronic, rehabilitation and other forms of post-active care. Further, only the victims of the motor vehicle accidents that occurred in the selected counties/districts

who made the initial contact, either as out-patients or in-patients, with one of the sixteen selected hospitals in the respective county/district qualified for the study. Victims who received treatment outside of the study hospitals, i.e. at physician office, are not included in the study.

The period of active treatment is determined as a time of hospital acute in-patient or out-patient care plus one month following the hospital acute discharge or release from emergency department respectively.

6.4. Cost Components

The following are the cost components of active treatment care as defined for the study victim:

1) Cost of active treatment in-patient hospital care.

This cost is calculated for the period of the initial and continuous hospital active treatment care at standard ward rates in 1975 and 1976. These per diem standard ward rates are applied to the length of stay in active treatment care. The rates, shown in the appendix, vary by the year and the study hospital.

The initial and continuous period of active treatment is inclusive of active treatment in another hospital following a direct transfer but excludes active treatment following a readmission.

2) Cost of out-patient treatment in the hospital emergency department. This cost is based on the standard rate per visit at \$18.10 and \$19.90 in 1975 and 1976 respectively. The rates include hospital charges only,

exclusive of medical and surgical fee. The fees of the attending physicians are covered under item 4 - medical fees.

- 3) Cost of therapy treatment. This cost is estimated as sum of therapy visits during the period of active treatment at set rates per visit. These rates are \$5.05 and \$5.55 for 1975 and 1976 respectively.
- 4) Cost of medical fees. This cost includes medical and surgical charges for the period of the victim's active treatment care. This includes charges for medical treatment during a hospital stay, plus charges for one month following either the release from emergency department or discharge from active hospital care. Subtracted from this total of medical fees are charges for identical medical procedures recorded for the victim in the month preceding the accident date.

Medical fees were captured from the O.H.I.P. medical claims at 90 percent of the O.M.A. Schedule of Fees. The cost of medical care was not ascertained for victims without O.H.I.P. coverage, e.g. out-of-province residents.

7. PROJECTIONS

The number of study victims and their respective cost of active treatment, as defined and captured in the study, were projected to the provincial total of hospitalized victims and their provincial total of active treatment cost. The projections of hospitalized in-patient and out-patient victims are based on quarterly ratios of study victims vs. all victims recorded on the Motor Vehicle Collision Reports (MVCR) in the six selected counties/districts. The ratios of study victims (hospitalized) vs. MVCR victims (hospitalized and non-hospitalized) were then applied to the provincial count of MVCR victims to obtain the provincial total of hospitalized victims.

	Study Victims (Hospitalized)		All MVCR Victims (Hospitalized and Non-hospitalized)		Ratio of Study vs. MVCR Victims		Projected Hospitalized Victims
<u>1975</u>							
Six Selected Counties/Districts	7,952	÷	14,307*	=	55.6%		-
Province of Ontario	-		97,034	x	55.6%	÷	53,923**
<u>1976</u>							
Six Selected Counties/Districts	6,907	÷	12,795*	=	54.0%		-
Province of Ontario	-		83,736	x	54.0%	÷	45,242**

*Number of victims in the six selected counties/districts are based on the MTC quarterly reports.

**Projected numbers of hospitalized victims are based on quarterly rather than annual ratios as shown in the table above. Therefore, the equations are approximative.

The average cost of active treatment was applied to the projected number of hospitalized victims to estimate the provincial cost of active treatment.

Resulting changes in projected cost are measured in 1975 (constant) as well as 1975 and 1976 (current) rates.

PROJECTED COST COMPOSITION OF HOSPITALIZED MOTOR VEHICLE
ACCIDENT INJURIES IN ONTARIO, 1975 AND 1976

Cost Composition	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Number of Victims	53,923	45,242	45,242
Average Cost per Victim	\$339.01	\$361.00	\$410.67
Total Cost*	\$18,280,436	\$16,332,362	\$18,579,532
Relative Change			
Number of Victims	-	-16.1%	-16.1%
Average Cost per Victim	-	+ 6.5%	+21.1%
Total Cost	-	-10.7%	+ 1.6%

*The rounding of the total projections to the nearest dollar is done for cross-reference purposes only. It does not imply that level of accuracy for these projections.

Due to the lower ratio of hospitalized victims in 1976, the projected reductions in number of hospitalized victims and their respective cost of active treatment are slightly larger than the reductions observed for the selected counties/districts only.

The projected number of hospitalized motor vehicle accident injury victims in the Province of Ontario declined from 53,923 to 45,242 between 1975 and 1976. This amounts to a reduction of 16.1 percent. The projected provincial cost of the active treatment for the hospitalized victims was reduced from \$18,280,436 to \$16,332,362 measured in constant 1975 rates. This amounts to a reduction of 10.7 percent. Therefore, the cost of active treatment would have been approximately \$2,000,000 less, if the rates of treatment remain unchanged. In 1976, the inflationary changes in the cost of treatment offset the projected savings.

7.1. Cost Components

The following is a summary table of the projected active treatment cost broken down by its components of health care as defined for the study:

ACTIVE TREATMENT COST OF HOSPITALIZED MOTOR VEHICLE
ACCIDENT INJURIES (MVAI) IN ONTARIO
1975 AND 1976

Cost Components*	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care (In-Patient)	\$14,505,595	\$13,077,920	\$15,056,065
Emergency Dept. (Out-Patient)	776,581	662,587	728,479
Therapy Treatment	142,722	116,242	126,897
Medical Fees	2,855,538	2,475,613	2,668,091
Total Cost*	\$18,280,436	\$16,332,362	\$18,579,532

*The rounding of the total and cost component projections to the nearest dollar is done for cross-reference purposes only. It does not imply that level of accuracy for these projections.

The changes in the cost are illustrated in both the constant and current rates. The table indicates a significant reduction in all observed components of care when measured in constant rates.

INDEX OF CHANGES IN THE ACTIVE TREATMENT
COST OF HOSPITALIZED MVAI IN ONTARIO, 1975 AND 1976

Cost Components	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care (In-Patient)	100%	90.2%	103.8%
Emergency Dept. (Out-Patient)	100%	85.3%	93.8%
Therapy Treatment	100%	81.4%	88.9%
Medical Fees	100%	86.7%	93.4%
Total	100%	89.3%	101.6%

The cost of active treatment hospital care for the in-patient victims of motor vehicle injuries has been reduced to 90.2 percent in constant 1975 per diem hospital rates. This represents a decrease of 9.8 percent (100% minus 90.2%) in constant rates. Among the cost components, the projected hospital in-patient care savings were the largest in absolute dollar amounts. In constant rates, the reduction in this component alone reached over \$1,400,000. In current 1976 rates, however, the hospital care cost went up by 3.8 percent, in part, due to increased length of hospital stay. All other cost components show reductions in both the constant and current rates. Reductions were observed in the cost of out-patient care in the emergency departments of general hospitals in Ontario. The cost of emergency care has declined to 85.3 percent and 93.8 percent when measured in constant and current rates respectively. Cost of

therapy treatment declined to 81.4 percent in constant and 88.9 percent in current rates.

The medical fees for active treatment amounted to \$2,475,613 down from \$2,855,538, a reduction of 13.3 percent (100% minus 86.7%). This represents the second largest savings in absolute dollars when measured in constant rates.

The projected numbers of hospitalized MVAI victims in Ontario who incurred respective component cost is shown in the following table. The distribution of the victims is based on relative component cost occurrence established by the monitoring system for the study victims. The frequency of occurrence of hospital care and emergency department cost provides distribution of hospitalized victims into in-patients and out-patients.

PROJECTED NUMBER OF HOSPITALIZED VICTIMS WHO
INCURRED RESPECTIVE COMPONENT COST

Cost Component	1975	1976	Changes in Percent
Hospital Care (In-Patient)	11,018	8,635	-21.6%
Emergency Dept. (Out-Patient)	42,905	36,607	-14.7%
Therapy Treatment	2,361	1,999	-15.3%
Medical Fees*	49,627	41,572	-16.2%
All Victims	53,923	45,242	-16.1%

*Medical fees were captured for only O.H.I.P. payments on behalf of victims.

Projected number of victims who required in-patient hospital care declined by 21.6 percent. Out-patient victims declined by 14.7 percent. The larger reduction in number of in-patient victims resulted in a lower ratio of in-patients among the projected number

of hospitalized victims in 1976. In-patients accounted for 20.4 percent of all hospitalized victims in 1975, and for 19.1 percent of all hospitalized victims in 1976.

7.2. Average Expenditure

The following table shows the average expenditure per hospitalized MVAI victim who incurred respective component cost in the study periods of 1975 and 1976. The average expenditures are derived by dividing the projected active treatment cost by the projected number of hospitalized victims shown in the foregoing table.

AVERAGE EXPENDITURE PER HOSPITALIZED VICTIM WHO INCURRED
RESPECTIVE COMPONENT COST

Cost Components	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care* (In-Patient)	\$1,316.54	\$1,514.52	\$1,743.61
Emergency Dept. (Out-Patient)	18.10	18.10	19.90
Therapy Treatment	60.45	58.15	63.48
Medical Fees	57.54	59.55	64.18
Total (All Victims)	\$339.01	\$361.00	\$410.67

*Provincial estimates of average cost of hospital care vary slightly due to rounding.

7.3. Patient-Days

According to the study projections, in 1975, in-patient victims spent 127,423 patient-days in active hospital care in Ontario. In 1976, the number of patient-days decreased to 111,088, a reduction of 12.8 percent.

In-Patient Statistics	1975	1976
Projected Number of In-Patient Victims	11,018	8,635
Number of Patient-Days	127,423 days	111,088 days
Average Length of In-Patient Stay	11.6 days	12.9 days

Despite a decrease in the total of patient-days, the average length of in-patient stay rose from 11.6 days to 12.9 days between 1975 and 1976. This increase in average length of stay is the major contributing factor for the increase in the average cost of active treatment per study victim.

8. STUDY FINDINGS

This section provides descriptive and tabular highlights of changes in the volume and composition of the active treatment cost for the victims of motor vehicle accident injuries treated in the study hospitals in 1975 and 1976. The study finding for the selected strata (6 counties/districts, 16 hospitals) differ somewhat from the provincial projections shown in the preceding section due to weighting. Findings are described by way of comparison between 1975 and 1976, the year "before", and the year "after", the compulsory seat belt legislation and reduced highway speed limits went into effect. The cost of active treatment is generally described in its aggregate form as a sum of hospital, therapy, out-patient and medical fees cost components.

The following table presents total and average costs of motor vehicle accident injuries and number of victims in the study. The cost estimates are shown in both the constant (1975) and in current (1975 and 1976) rates.

COST COMPOSITION OF THE MOTOR VEHICLE ACCIDENT
INJURIES (MVAI) IN THE 16 STUDY HOSPITALS
IN ONTARIO, 1975 AND 1976

	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Number of Victims	7,952	6,907	6,907
Average Cost per Victim	\$339.01	\$361.00	\$410.67
Total Cost	\$2,695,808	\$2,493,427	\$2,836,498
Index (1975 = 100%)			
Number of Victims	100%	86.9%	86.9%
Average Cost per Victim	100%	106.5%	121.1%
Total Cost	100%	92.5%	105.2%
Relative Change			
Number of Victims	-	-13.1%	-13.1%
Average Cost per Victim	-	+6.5%	+21.1%
Total Cost	-	-7.5%	+5.2%

There was a marked reduction in the number of victims treated in the 16 study hospitals in 1976. The number of hospitalized victims was down to 6,907, a reduction of 1,045 victims or 13.1 percent. However, the average cost of active treatment per victim increased from \$339.01 to \$361.00 and \$410.67 measured in constant (1975) and current rates respectively.

In combining the above two factors, the reduced number of victims and the higher average cost of active treatment, resulted in a total cost reduction of 7.5 percent measured in constant rates. In current rates a total cost of active treatment rose by 5.2 percent. In dollars, the cost of active treatment would have been \$202,381 less, if the rates of treatment remained unchanged. As the rates changed, the 1976 cost increased by \$140,690 (\$2,836,498 minus \$2,695,808).

8.1. Cost Components

The following is a summary table of the active treatment cost broken down by its components of health care:

ACTIVE TREATMENT COST OF THE MOTOR VEHICLE ACCIDENT
INJURIES (MVAI) IN THE 16 STUDY HOSPITALS IN ONTARIO
1975 AND 1976

Cost Components	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care (In-Patient)	\$2,139,359	\$1,996,804	\$2,298,833
Emergency Dept. (Out-Patient)	114,573	101,161	111,211
Therapy Treatment	20,856	17,736	19,360
Medical Fees	421,020	377,726	407,094
Total Cost	\$2,695,808	\$2,493,427	\$2,836,498

The table indicates significant reductions in all observed components of care. The changes in the cost are illustrated in both the constant and current rates.

INDEX OF CHANGES IN THE ACTIVE TREATMENT
COST OF MVAI IN THE 16 STUDY HOSPITALS
IN ONTARIO, 1975 AND 1976

Cost Components	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care (In-Patient)	100%	93.3%	107.5%
Emergency Dept. (Out-Patient)	100%	88.3%	97.1%
Therapy Treatment	100%	85.0%	92.8%
Medical Fees	100%	89.7%	96.7%
Total	100%	92.5%	105.2%

The cost of active treatment hospital care for the in-patient victims of motor vehicle injuries has been reduced to 93.3 percent in constant per diem hospital rates. This represents a decrease of 6.7 percent (100% minus 93.3%). The magnitude of these reductions is consistent with the later findings that indicate a shift towards less severe injuries among the victims in 1976 than in 1975. In dollars, the cost of hospital care would have been \$142,555 less (\$2,139,359 minus \$1,996,804), if the 1975 hospital per diem rates remain unchanged. As the rates increased, the cost of hospital care rose by \$159,474 or by 7.5 percent.

The cost of emergency care declined to 88.3 percent and 97.1 percent when measured in constant and current rates respectively. The medical fees for active treatment in constant rates amounted to \$377,726 in 1976, down from \$421,020 in the same period of 1975. This is the second largest amount in terms of cost reduction.

The general decreases in the four cost components of active treatment care were composed of: 1) changes in the number of victims who incurred component costs, and 2) changes in the average amount of component cost per victim. These changes are described in the following two tables:

NUMBER OF VICTIMS WHO INCURRED
RESPECTIVE COMPONENT COST

Cost Components	1975	1976	Change In Percent
Hospital Care (In-Patient)	1,622	1,318	-18.7
Emergency Dept. (Out-Patient)	6,330	5,589	-11.7
Therapy Treatment	345	305	-11.6
Medical Fees*	7,317	6,343	-13.3
All Victims	7,952	6,907	-13.1

*Medical fees were captured for only O.H.I.P. payments on behalf of victims.

The largest decline in number of victims by cost component is evident for hospital in-patient care. Number of victims requiring in-patient care was reduced between 1975 and 1976 by 18.7 percent. Out-patient care in the study hospitals' emergency departments was reduced by 11.7 percent.

There were only 345 and 305 victims who attended at least one therapy visit among the respective 7,952 and 6,907 victims in 1975 and 1976. It could be that therapy treatment prevailed among the non-hospitalized victims who were not part of the study, i.e. persons with minor whiplash injuries visit physician's and therapist's offices only.

Some of the study victims did not have any O.H.I.P. medical fees recorded in the defined search period. These victims could be divided into three categories: 1) no medical treatment was required, 2) victims did not have O.H.I.P. coverage and 3) no medical claims were submitted in time for the survey. For the large majority of the study victims (7,317 in 1975 and 6,343 in 1976) the medical fee expenditure was recorded.

8.2. Average Expenditure

The following table shows the average expenditure per study victim who incurred a respective component cost in the study periods of 1975 and 1976.

AVERAGE EXPENDITURE PER VICTIM WHO INCURRED
RESPECTIVE COMPONENT COST

Cost Components	1975 (at 1975 rates)	1976 (at 1975 rates)	1976 (at 1976 rates)
Hospital Care (In-Patient)	\$1,318.96	\$1,515.03	\$1,744.18
Emergency Dept. (Out-Patient)	18.10	18.10	19.90
Therapy Treatment	60.45	58.15	63.48
Medical Fees	57.54	59.55	64.18
Total (All Victims)	\$339.01	\$361.00	\$410.67

The largest average expenditure was incurred by victims who required in-patient hospital care. This expenditure varied in constant 1975 rates from \$1,318.96 to \$1,515.03 for 1975 and 1976 respectively. According to the monitoring system, there were 68 and 113 victims in the respective 1975 and 1976 study periods who incurred over \$5,000 of hospital care expenditure during their in-patient stay.

The emergency department care was calculated at the set rates of \$18.10 and \$19.90 per out-patient victim for 1975 and 1976. These rates are directly reflected in the average cost of treatment in the foregoing table. The cost of therapy treatment, that included physio and occupational therapy was also estimated at set rates of \$5.05 and \$5.55 per visit in 1975 and 1976 respectively. From the average cost of therapy treatment the number of therapeutic visits per victim who required therapy can be estimated. There were nearly 12 therapy visits per therapy treated victim ($\$60.45 \div \5.05) during the 1975 study period, and approximately 11.4 therapy visits per therapy treated victim ($\$63.48 \div \5.55) during the 1976 study period.

Little change was evident in the average amount of medical cost per victim. The average sum of medical claims in constant rates amounted to \$57.54 and \$59.55 per victim who incurred medical cost in 1975 and 1976.

8.3. Seasonal Changes in Number of Injuries

Variations in number of motor vehicle injuries treated in the study hospitals are described through monthly and quarterly changes between 1975 and 1976. In addition, monthly and quarterly statistics from the Ontario Ministry of Transportation and Communications (MTC) for all motor vehicle injuries (hospitalized and non-hospitalized) in the Province of Ontario are shown for 1975 and 1976. In interpreting the seasonal changes between 1975 and 1976 the following patterns can be observed: 1) There were measurable decreases in the number of injuries in all months for 1976. These decreases are equally evident from the monitoring system

statistics of selected hospitalized victims as well as from MTC monthly data. 2) The largest decline in number of injuries is shown for the month of February. This is probably related to the fact that both the enforcement of the seat belt legislation and posting of the lower speed limits began in that month in 1976. 3) While the lower number of injuries was observed for all months of 1976, the magnitude of monthly decreases was irregular.

Quarter/ Month	Number of Study Victims 1975	1976	Change in Percent
Quarter I	(1,491)	(1,244)	(-16.6)
January	530	501	- 5.5
February	491	341	-30.5
March	470	402	-14.5
Quarter II	(1,943)	(1,709)	(-12.0)
April	480	420	-12.5
May	679	563	-17.1
June	784	726	- 7.4
Quarter III	(2,292)	(2,127)	(- 7.2)
July	738	708	- 4.1
August	811	715	-11.8
September	743	704	- 5.2
Quarter IV	(2,226)	(1,827)	(-17.9)
October	768	655	-14.7
November	751	531	-29.3
December	707	641	- 9.3
Total	7,952	6,907	-13.1

The following table presents monthly and quarterly data from the Ontario Ministry of Transportation and Communications on number of all motor vehicle injuries in 1975 and 1976. All monthly changes indicate downward movements for 1976. The size of the decreases was again irregular.

Quarter/ Month	Number of Motor Vehicle Injuries in Ontario		Change in Percent
	1975	1976	
Quarter I	(19,958)	(16,584)	(-16.9)
January	6,489	6,152	- 5.2
February	6,923	5,228	-24.5
March	6,546	5,204	-20.5
Quarter II	(24,030)	(20,134)	(-16.2)
April	5,922	5,608	- 5.3
May	8,480	6,702	-21.0
June	9,628	7,824	-18.7
Quarter III	(27,466)	(24,309)	(-11.5)
July	9,006	8,439	- 6.3
August	9,898	8,187	-17.3
September	8,562	7,683	-10.3
Quarter IV	(25,580)	(22,709)	(-11.2)
October	8,231	7,750	- 5.8
November	8,651	6,651	-23.1
December	8,698	8,308	- 4.5
Total	97,034	83,736	-13.7

Source: Ministry of Transportation and Communications
"Motor Vehicle Accident Facts, 1975-76"

The seasonal monthly examination of the preceding table reveals the months of June, July, August and December were the heaviest months in the number of injuries reported, irrespective of changes between 1975 and 1976. In June, July and August of 1975 over 9,000 injuries were reported monthly. In the same months of 1976, the number of injuries was around 8,000 per month. In total, the number of persons injured in Ontario decreased by 13.7 percent, down from 97,034 in 1975 to 83,736 in 1976.

8.4. Seasonal Changes in Active Treatment Cost

The total cost of active treatment for the study victims is shown below, distributed by month and quarter of injury occurrence.

Quarter/ Month	Total Cost of Active Treatment		Change in Percent
	1975 (at 1975 rates)	1976 (at 1975 rates)	
Quarter I	(\$487,922)	(\$363,485)	(-25.5)
January	173,944	140,593	-19.2
February	158,281	98,863	-37.5
March	155,697	124,029	-20.3
Quarter II	(\$744,516)	(\$678,743)	(- 8.8)
April	194,566	196,680	+ 1.1
May	279,989	250,069	-10.7
June	269,961	231,994	-14.1
Quarter III	(\$742,884)	(\$825,869)	(+11.2)
July	284,913	230,803	-19.0
August	271,695	354,908	+30.6
September	186,276	240,158	+28.9
Quarter IV	(\$720,525)	(\$625,390)	(-13.2)
October	250,147	279,835	+11.9
November	261,222	200,987	-23.1
December	209,156	144,568	-30.9
Total*	\$2,695,808	\$2,493,427	- 7.5

*Total may not add due to computer rounding.

Monthly changes in the cost resulted in reductions in eight months and increases in the remaining four months. There is a period of three months (August, September and October) during which increases in the cost occurred. The largest reduction in the cost of active treatment was recorded in the month of February. As noted earlier, this was the first month when seat belt legislation was enforced and the lower speed limits were posted.

8.5. County/District of Injury

A total of 14,859 victims of motor vehicle accidents captured by the monitoring system as patients who were treated at the selected hospitals in 1975 and 1976 is distributed by county/district and by year of injury as follows:

County/District	Number of Study Victims		Change in Percent
	1975	1976	
Middlesex	2,224	1,966	-11.6
Waterloo	1,511	1,355	-10.3
Peterborough	895	619	-30.8
Frontenac	729	605	-17.0
Sudbury	1,531	1,265	-17.4
Thunder Bay	1,062	1,097	+ 3.3
Total	7,952	6,907	-13.1

Comparisons between the two study periods show that the number of victims declined, with one exception, in all of the selected counties/districts. The largest decline was observed in the county of Peterborough with a reduction of 30.8 percent. The overall decline for the selected counties/districts was 13.1 percent. In absolute numbers this amounted to 1,045 fewer victims hospitalized in the selected hospitals in 1976.

The total cost of active treatment for the study victims distributed by the selected counties/districts varied as follows:

County/District	Total Cost of Active Treatment		Change in Percent
	1975 (at 1975 rates)	1976 (at 1975 rates)	
Middlesex	\$ 873,329	\$ 807,189	- 7.6
Waterloo	454,240	423,204	- 6.8
Peterborough	253,811	228,559	- 9.9
Frontenac	267,574	304,966	+14.0
Sudbury	497,988	433,415	-13.0
Thunder Bay	348,921	296,167	-15.1
Total*	\$2,695,808	\$2,493,427	- 7.5

*Total may not add due to computer rounding.

The total cost of active treatment declined with one exception in all the selected counties/districts. The largest relative reduction in the cost was observed in the District of Thunder Bay.

Despite the cost reductions recorded for five out of six counties/districts in the study, there is a considerable variance in the relative percentage of cost reductions by the selected areas. The same applies for the variable reductions in number of study victims. If the reductions in the number of victims and the cost of motor vehicle accident injuries are inferred from the 1976 changes in the laws governing automobile transportation, i.e. compulsory seat belt legislation and reduced highway speed limits, then these legal changes produced different degrees of success in different parts of Ontario.

8.6. Study Hospitals

Distribution of the victims and their incurred cost of active treatment in 1975 and 1976 are described by the selected study hospitals.

Hospital Centre	Study Hospital	Number of Victims	
		1975	1976
London	St. Joseph's	727	614
London	Victoria	1,233	1,088
London	University	264	264
Kitchener	Kitchener-Waterloo	924	752
Kitchener	St. Mary's General	587	603
Peterborough	Peterborough Civic	542	397
Peterborough	St. Joseph's General	353	222
Kingston	Hotel Dieu	326	288
Kingston	Kingston General	403	317
Sudbury	St. Joseph's*	9	-
Sudbury	Sudbury General	1,186	928
Sudbury	Sudbury Memorial	327	319
Sudbury	Laurentian**	9	18
Thunder Bay	The General Hospital of Port Arthur	139	162
Thunder Bay	St. Joseph's General	367	397
Thunder Bay	McKellar General	556	538
Total		7,952	6,907

*St. Joseph's in Sudbury was closed June 1975.

**Laurentian in Sudbury was opened June 1975.

With some exceptions, the number of victims declined in the majority of selected hospitals. In four hospitals, Peterborough Civic, Peterborough St. Joseph's, Kingston General and Sudbury General, reductions in the number of motor vehicle accident injuries reached over 20 percent. However, the changes in number of victims treated by the individual study hospitals could signify, in addition to intrinsic effects of seat belt laws and reduced speed limits, local adjustments in organization of health care delivery, e.g. closure of a hospital, enlargement of an emergency department, etc.

The total cost of active treatment by hospital and by year is reflected in the following table:

Hospital Centre	Study Hospital	Total Cost of Active Treatment	
		1975 (at 1975 rates)	1976 (at 1975 rates)
London	St. Joseph's	\$ 242,675	\$ 147,485
London	Victoria	427,901	512,784
London	University	202,754	146,921
Kitchener	Kitchener-Waterloo	298,339	250,596
Kitchener	St. Mary's General	155,901	172,608
Peterborough	Peterborough Civic	131,944	134,251
Peterborough	St. Joseph's General	121,867	94,307
Kingston	Hotel Dieu	79,720	70,179
Kingston	Kingston General	187,853	234,787
Sudbury	St. Joseph's*	4,627	-
Sudbury	Sudbury General	366,682	305,519
Sudbury	Sudbury Memorial	124,360	101,583
Sudbury	Laurentian**	2,320	26,312
Thunder Bay	The General Hospital of Port Arthur	54,138	53,487
Thunder Bay	St. Joseph's General	104,134	82,110
Thunder Bay	McKellar General	190,650	160,570
Total***		\$2,695,808	\$2,493,427

*St. Joseph's in Sudbury was closed June 1975.

**Laurentian in Sudbury was opened June 1975.

***Numbers may not add due to computer rounding.

8.7. Sex and Age of Victims

The changes in the sex and age distribution of victims are shown in the following table:

Sex	Number of Victims		Change in Percent
	1975	1976	
Male	4,692 (59.0%)	4,058 (58.8%)	-13.5
Female	3,259 (41.0%)	2,846 (41.2%)	-12.7
Unknown	1	3	N.A.
<u>Age</u>			
0- 4 years	249	199	-20.1
5- 9 years	343	384	+12.0
10-14 years	426	366	-14.1
15-19 years	1,815	1,579	-13.0
20-24 years	1,599	1,400	-12.4
25-29 years	864	778	-10.0
30-59 years	2,127	1,794	-15.7
60 plus	526	407	-22.6
Unknown	3	-	N.A.
Total	7,952	6,907	-13.1

The number of victims by age classification declined in all but one category between the two study periods. The age category 5-9 years increased from 343 to 384 victims. Men accounted for 59.0 percent and 58.8 percent of the victims in the 1975 and 1976 study periods respectively. The observed percentage reductions of male and female victims between the study periods were 13.5 percent and 12.7 percent.

The total cost of active treatment for the study victims by sex and age is shown in the following table.

Sex	Total Cost of Active Treatment		Change in Percent
	1975 (at 1975 rates)	1976 (at 1975 rates)	
Male	\$1,817,980	\$1,651,318	- 9.2
Female	877,781	838,517	- 4.5
Unknown	47	3,592	N.A.
<u>Age</u>			
0- 4 years	\$ 80,586	\$ 55,516	-31.1
5- 9 years	117,756	143,441	+21.8
10-14 years	168,953	143,620	-15.0
15-19 years	534,975	605,897	+13.3
20-24 years	544,200	493,947	- 9.2
25-29 years	233,686	226,353	- 3.1
30-59 years	678,777	557,492	-17.9
60 plus	336,811	267,194	-20.7
Unknown	83	-	N.A.
Total*	\$2,695,808	\$2,493,427	- 7.5

*Numbers may not add due to computer rounding.

Changes in cost by age categories of study victims contain both reductions and increases in the amount of health care expenditure. Due to the large cost variance and the subsequent statistical error, it remains unclear whether the observed upward cost movements in some age categories reflect objective trends or merely project random fluctuations.

8.8. Diagnosis of Injury

The Abbreviated Injury Scale (AIS) by body region or area was used to classify the type of motor vehicle injuries in this study. The AIS (1976 revision) was developed by a Joint Committee of The American Medical Association, The Society of Automotive

Engineers and The American Association for Automotive Medicine. The AIS contains both the classification of body area as well as the severity scale of injury. Because of the limited description of the primary diagnoses on the hospital discharge forms as well as on the out-patient treatment forms, a number of injuries were not classified. In order to improve identification of injuries by body area from the available sources, three categories were added to the AIS. These categories are: "multiple areas", a combination of more than one of the AIS categories; "mind", a mental disturbance, or nervous shock; and "back", referring to the back and spine injuries not specifically described as cervical, thoracic or lumbar spine injury.

Body Area of Injury	Number of Victims 1975	1976	Change in Percent
General, external/ multiple area*	1,476	1,215	-17.7
Head	2,529	2,161	-14.6
Neck and cervical spine	630	521	-17.3
Chest and thoracic spine	375	324	-13.6
Abdomen and lumbar spine	181	190	+ 5.0
Pelvic girdle	150	142	- 5.3
Extremities	2,029	1,918	- 5.5
Mind*	45	66	N.A.**
Back*	217	214	N.A.**
Not classified	320	156	N.A.**
Total	7,952	6,907	-13.1

*Added body area of injury to the AIS classification.

**The "mind" and "back" categories were added after the coding for the first three months of 1975 was nearly completed. Prior to their addition, such injuries would be coded as "not classified", consequently the last three categories above are not fully comparable for the study periods.

The most frequent injuries were observed for head, extremities, general, external/multiple areas, neck and cervical spine. With few exceptions, all types of injuries displayed small to moderate reductions between the two study periods.

The total cost of active treatment by body area of injury is shown in the following table:

Body Area of Injury	Total Cost of Active Treatment		Change in Percent
	1975 (at 1975 rates)	1976 (at 1975 rates)	
General, external/ multiple areas	\$ 454,407	\$ 204,184	-55.1
Head	479,532	563,951	+17.6
Neck and cervical spine	122,511	126,788	+ 3.5
Chest and thoracic spine	198,979	153,378	-22.9
Abdomen and lumbar spine	212,519	273,232	+28.6
Pelvic girdle	185,938	151,494	-18.5
Extremities	980,264	979,288	- 0.1
Mind	7,140	5,233	N.A.
Back	20,903	24,379	N.A.
Not classified	33,640	11,546	N.A.
Total*	\$2,695,808	\$2,493,427	- 7.5

*Numbers may not add due to computer rounding.

N.A.: Estimates of percentage change are not available due to small number of observations and/or interim adjustments in categories tabulated.

Increases in the cost of active treatment were observed for abdomen and lumbar spine injuries, neck and cervical spine, and head injuries. Remaining categories showed cost savings. The most substantial reductions were achieved in general, external/multiple areas injuries followed by chest and thoracic spine and pelvic girdle injuries.

The average total cost of active treatment by body area of injury increased for five of the categories and decreased for the rest.

Body Area of Injury	Average Total Cost of Active Treatment	
	1975 (at 1975 rates)	1976 (at 1975 rates)
General, external/ multiple areas	\$ 308.00	\$ 168.00
Head	190.00	261.00
Neck and cervical spine	194.00	243.00
Chest and thoracic spine	531.00	473.00
Abdomen and lumbar spine	1,174.00	1,438.00
Pelvic girdle	1,240.00	1,067.00
Extremities	483.00	511.00
Mind	159.00	79.00
Back	96.00	114.00
Not classified	105.00	74.00
Total	\$339.01	\$361.00

Due to the large variance and the subsequent standard error of mean, few reliable conclusions can be drawn from the average costs. Larger sub-samples of victims would improve reliability of these statistics.

Valid statements that can be made are irrespective of the year of study. These are: 1) The most "costly" types of injuries were abdomen and lumbar spine and pelvic girdle injuries. These injuries averaged a cost of over \$1,000. 2) The next most "costly" categories are chest and thoracic spine and injuries to extremities. The cost of active treatment for these injuries averaged approximately \$500.

8.9. Severity of Injury

The tabulated average amounts of medical costs in the foregoing section are subject to significant variation by severity of injury within the body area classification. The Abbreviated Injury Scale was also used to ascertain the severity of the victim's injury. Again, due to the limited diagnostic description of the injuries, some injuries were not classified as to severity. The results for the study periods are shown in the following table:

Severity of Injury	Number of Victims		Change
	1975	1976	in Percent
No injury	-	-	-
Minor	5,946	5,175	-13.0
Moderate	730	624	-14.5}
Severe (not life-threatening)	399	341	-14.5}
Serious (life-threatening)	132	107	-18.9} -14.5
Critical (survival uncertain)	47	38	-19.1}
Maximum (currently untreatable)	6	14	+133.3}
Unknown	692	608	-12.1
Total	7,952	6,907	-13.1

The minor injuries declined by 13.0 percent between the 1975 and 1976 study periods. Injuries other than minor and unknown were reduced by 14.5 percent. With the exception of maximum severity, there appears a positive link between severity scale of injury and rate of reduction in the number of victims in 1976. This indicates a decrease in severity scale of the motor vehicle injuries in 1976. The fatality among the study victims is indicated in the following table:

Fatality	Number of Victims	
	1975	1976
Victim discharged	7,849	6,810
Victim died	103	97

In 1975, 103 deaths were reported among the 7,952 study victims. In 1976, 97 of the study victims died.

The above fatalities do not indicate the total number of motor vehicle accident deaths in the selected counties/districts. When death occurred at the scene of an accident, victim was not taken to study hospital and was not part of this study.

According to the Ontario Ministry of Transportation and Communications, a total of 1,800 persons and 1,511 persons were killed in motor vehicle accidents in Ontario in 1975 and 1976 respectively. The fewer fatalities in 1976 represent a reduction of 16.1 percent.

The total cost of active treatment by severity of injury for the study victims is described in the following table:

Severity of Injury	Total Cost of Active Treatment		Change in Percent
	1975 (at 1975 rates)	1976 (at 1975 rates)	
No injury	-	-	-
Minor	\$ 373,826	\$ 298,337	-20.2
Moderate	799,171	694,544	-13.1
Severe (not life-threatening)	855,607	783,118	- 8.5
Serious (life-threatening)	373,324	430,885	+15.4
Critical (survival uncertain)	145,665	187,120	+28.5
Maximum (currently untreatable)	581	21,453	N.A.**
Unknown	147,649	78,005	-47.2
Total*	\$2,695,808	\$2,493,427	- 7.5

*Numbers may not add due to computer rounding.

**Change in percent not calculated due to low number of victims.

Despite the reduction in the number of seriously and critically injured victims for the 1976 period, there appeared to be measurable increases in the amount of active treatment cost for these two categories of victims. This observation could be a random occurrence subject to the small number of seriously or critically injured persons in the study and the large variance in the average cost of their active treatment. However, it could also reflect that relatively more health care resources are directed towards the seriously and critically injured.

In addition to the table on total cost of active treatment, this section contains the average cost of active treatment per victim by severity of injury. The rising amounts of average cost coincide with the increased severity scale, as would be expected.

Severity of Injury	Average Total Cost of Active Treatment	
	1975 (At 1975 rates)	1976 (At 1975 rates)
No injury	-	-
Minor	\$ 63.00	\$ 58.00
Moderate	1,095.00	1,113.00
Severe (not life-threatening)	2,144.00	2,297.00
Serious (life-threatening)	2,828.00	4,027.00
Critical (survival uncertain)	3,099.00	4,924.00
Maximum (currently untreatable)	97.00	1,532.00
Unknown	213.00	128.00
Total	\$ 339.01	\$ 361.00

The average cost per victim varied from \$63 for a minor injury to \$3,099 for a critical injury in the 1975 study period. In 1976 the average cost per victim was \$58 for a minor injury and \$4,924 for a critical injury.

The average amount of medical fees per victim by severity of injury is shown in the following table:

Severity of Injury	Average Medical Cost of Active Treatment	
	1975 (At 1975 rates)	1976 (At 1975 rates)
No injury	-	-
Minor	\$ 21.00	\$ 20.00
Moderate	117.00	125.00
Severe (not life-threatening)	219.00	239.00
Serious (life-threatening)	316.00	372.00
Critical (survival uncertain)	374.00	554.00
Maximum (currently untreatable)	46.00	283.00
Unknown	90.00	79.00
Total	\$ 52.95	\$ 54.69

The average amount of medical fees correlates positively with the severity of injury scale. The largest medical cost per victim was observed in the critical category.

8.10. Length of Hospital Stay

The study victims of the motor vehicle accident injuries are examined by their length of active treatment hospital stay. Two distinct types of victims emerged from the study: 1) Out-patients - injured persons who were treated in the hospital emergency department and released; 2) In-patients - injured persons who were admitted to the hospital active care unit for treatment. The in-patients stayed at least 1 day in the study hospital before their hospital discharge. They comprised approximately one-fifth of the study victims.

In the 1975 study period 1,622 victims were admitted to the study hospitals as in-patients. They accounted for 20.4 percent of the period's victims and generated 18,742 hospital days. This averages to 11.6 days per in-patient victim in 1975. In the 1976 study period 1,318 victims were admitted to the study hospitals. They accounted for 19.1 percent of the period's victims and generated 16,954 hospital days. This averages to 12.9 days per in-patient victim in 1976.

The number of study victims by length of hospital stay is illustrated in the following table:

Length of Stay	Number of Victims 1975	Number of Victims 1976	Change in Percent
Out-Patients	6,330	5,589	-11.7
In-Patients	1,622	1,318	-18.7
1 day	(290)	(230)	(-20.7)
2 to 7 days	(711)	(544)	(-23.5)
8 to 14 days	(280)	(258)	(- 7.9)
15 to 30 days	(185)	(132)	(-28.6)
31 plus days	(156)	(154)	(- 1.3)
Total	7,952	6,907	-13.1

The number of study victims declined in all length of stay categories for the 1976 study period. The decrease in the in-patient category was more pronounced than in the out-patient category with a reduction of 18.7 percent.

The following table shows the total cost of active treatment by length of hospital stay:

Length of Stay	Total Cost of Active Treatment		Change in Percent
	1975 (At 1975 rates)	1976 (At 1975 rates)	
Out-patients	\$ 288,402	\$ 249,124	-13.6
In-patients	2,407,406	2,244,303	-6.8
1 day	(49,451)	(40,521)	(-18.1)
2 to 7 days	(383,612)	(302,926)	(-21.0)
8 to 14 days	(384,341)	(368,363)	(- 4.2)
15 to 30 days	(505,902)	(367,388)	(-27.4)
31 plus days	(1,084,100)	(1,165,105)	(+ 7.5)
Total	\$2,695,808	\$2,493,427	-7.5

The average cost of active treatment per victim by length of hospital stay reflects positive correlation between the two indicators.

Length of Stay	Average Total Cost of Active Treatment per Victim	
	1975 (At 1975 rates)	1976 (At 1975 rates)
Out-patients	\$ 46.00	\$ 45.00
In-patients	1,521.00	1,703.00
1 day	171.00	176.00
2 to 7 days	540.00	557.00
8 to 14 days	1,373.00	1,428.00
15 to 30 days	2,735.00	2,783.00
31 plus days	6,950.00	7,566.00
Total	\$ 339.01	\$ 361.00

The length of active treatment hospital stay is also compared directly with the in-patient hospital care cost, one of the four components of the total cost of active treatment. The in-patient hospital care cost for the out-patient victims is nil by definition.

Length of Stay	In-Patient Hospital Care Cost of Active Treatment		Change in Percent
	1975 (At 1975 rates)	1976 (At 1975 rates)	
1 day	\$ 31,451	\$ 25,406	-19.2
2 to 7 days	314,661	247,475	-21.4
8 to 14 days	333,099	311,228	- 6.6
15 to 30 days	447,070	326,213	-27.0
31 plus days	1,013,078	1,086,482	+ 7.2
Total	\$2,139,359	\$1,996,804	- 6.7

The overall reduction in the hospital care cost of 6.7 percent approximates a total cost reduction of 7.5 percent.

A high degree of positive correlation is observed between the length of hospital stay and the average hospital care cost per victim, as these two variables are closely inter-dependent.

Length of Stay	Average In-Patient Hospital Care Cost of Active Treatment per Victim	
	1975 (At 1975 rates)	1976 (At 1975 rates)
1 day	\$ 108.00	\$ 110.00
2 to 7 days	443.00	455.00
8 to 14 days	1,190.00	1,206.00
15 to 30 days	2,417.00	2,471.00
31 plus days	6,494.00	7,055.00
Total (In-Patients)	\$1,318.96	\$1,515.03
Total (All Victims)	\$269.03	\$289.10

8.11. Seat Belt Usage

The compulsory seat belt legislation was followed by a more comprehensive completion of the motor vehicle collision reports (MVCR). Beginning with 1976, the police in the Province of Ontario were instructed to report, on the MVCR, the seat belt usage and victim's location in the vehicle for all persons injured. Prior to 1976 the seat belt usage and victim's location was ascertained for injured driver only. This accounts for the large category of "passenger, location unknown" in the 1975 study period. The "cyclist" category includes bicyclist, moped driver, motorcycle driver and motorcycle passenger.

The following table illustrates the distribution of victims by their location in the vehicle, where applicable. Only the driver's location and pedestrian categories are comparable between the two study periods of 1975 and 1976.

Victim's Location in the Vehicle	Number of Victims 1975	Number of Victims 1976	Percent* Distribution 1976
Right front seat	5	1,463	21.2
Middle front seat	-	165	2.4
Left front seat (driver)	3,447	2,839	41.1
Right rear seat	-	273	4.0
Middle rear seat	-	54	0.8
Left rear seat	-	178	2.6
Passenger, location unknown	3,203	197	2.9
Non-Applicable Categories:			
Pedestrian	634	613	8.9
Cyclist	609	881	12.8
Unknown type of victim	54	244	3.5
Total	7,952	6,907	100.0

*Percents may not add due to rounding.

The "left front" location (driver's seat) dominates the distribution of injuries, followed by "passenger, location unknown" category in the 1975 study period. The number of injuries to persons classified as pedestrians accounted for 8.9 percent of study victims in the 1976 period.

Distribution of seat belt usage, reported or otherwise is shown by the number of study victims. This distribution which is not fully comparable by the study periods due to the changes in reporting, helps illustrate the effects of these changes.

Seat Belt Usage in the Vehicle	Number of Victims 1975	Number of Victims 1976	Percent Distribution 1976	Adjusted Percent Distribution 1976
Installed, used	383	3,191	46.2	61.7
Installed, not used	2,516	1,134	16.4	21.9
Installed, use unknown	32	66	1.0	1.3
Not installed	238	357	5.2	6.9
Not reported	3,486*	421	6.1	8.1
(Sub-Total)	(6,655)	(5,169)	(74.8)	(100.0)
Non-Applicable Categories:				
Pedestrian	634	613	8.9	-
Cyclist	609	881	12.8	-
Unknown type of victim	54	244	3.5	-
Total	7,952	6,907	100.0	-

*These are mainly passengers for whom seat belt usage was not reported in 1975.

The above seat belt classification is a combination of the seat belt availability in the vehicle and its respective usage. According to the motor vehicle collision reports completed by the police at the scene of an accident, 46.2 percent of the study

victims in 1976 used seat belts. This amounts to 61.7 percent for the "inside the vehicle" victims. It is of significance to note that among the "inside the vehicle" victims, who could have benefited directly from seat belt usage, the volume of injuries declined by 22.3 percent (6,655 vs. 5,169). This decrease is greater than the overall reduction of 13.1 percent in the number of all study victims between 1975 and 1976.

Comparable changes in the seat belt usage between the two study periods can be observed for driver victims for whom the usage was recorded in both years. The driver victims were defined as study victims who occupied the left front seat in the accident vehicle.

Seat Belt Usage	Number of Driver Victims	
	1975	1976
Installed, used	381	1,910
Installed, not used	2,511	591
Installed, use unknown	32	36
Not installed	238	157
Not reported	9	1
Unknown	276	144
Total (Driver Victims)	3,447	2,839

A dramatic increase in seat belt usage among the driver victims can be observed. The reported number of seat belt users among drivers extended from 381 victims in 1975 to 1,910 victims in 1976, a five fold increase. A note of caution should be made, however, since these figures are dependent on the honest reporting of seat belt use by the victims to the police. This refers particularly to 1976, when drivers as well as passengers were required by the law to wear seat belts.

Significant variance in the average cost of active treatment can be observed by the seat belt usage in the 1976 study period. In this period reporting on seat belt usage was available for almost all "inside the vehicle" victims, i.e. drivers and passengers.

Seat Belt Usage in the Vehicle	Average Cost of Active Treatment 1976 (at 1975 rates)	
Installed, used	\$228.00	
Installed, not used	381.00}	
Installed, use unknown	396.00}	\$419.00
Not installed	445.00}	
Not reported	501.00}	
(Sub-Total)	(301.00)	
Non-Applicable Categories:		
Pedestrian	693.00	
Cyclist	498.00	
Unknown type of victim	306.00	
Total	\$361.00	

The average cost of active treatment among the victims who reported use of seat belts was \$228.00. The rest of the "inside the vehicle" victims incurred an average cost of \$419.00 per active treatment. The difference between the two average costs is figuratively large and statistically significant. It should be noted that a systematic bias in "reported" as compared to "actual" seat belt usage can affect the average cost of active treatment between reportedly belted and unbelted victims. It is plausible that some less severely injured victims told police that they were wearing seat belts when they were not doing so,

while the belt use among the more severely injured was actually observed. The potential effect of this bias on seat belt effectiveness can be substantial.

Among the other study groupings, the highest average cost of \$693.00 was observed for pedestrians. The average cost for the "cyclist" category, that includes bicyclist, moped and motorcycle driver and passenger, amounted to \$498.00.

A P P E N D I X

Monitoring Information System
For Motor Vehicle Accident Injuries
1975 & 1976

<u>MVCR:</u>	<u>Code</u>	<u>Keypunch Columns</u>
1) COUNTY OF COLLISION	<div style="border: 1px solid black; width: 100px; height: 15px; margin-left: 580px;"></div>	1
2) SURNAME OF VICTIM	<div style="border: 1px solid black; width: 200px; height: 15px; margin-left: 590px;"></div>	2/11
3) GIVEN NAME OR INITIALS	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 770px;"></div>	12/14
4) CITY/TOWN OF RESIDENCE		
5) VICTIM LOCATION	<div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 820px;"></div>	15
6) SEAT BELTS USAGE	<div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 820px;"></div>	16
7) DATE OF COLLISION	<div style="border: 1px solid black; width: 40px; height: 15px; margin-left: 665px;"></div> <div style="border: 1px solid black; width: 40px; height: 15px; margin-left: 740px;"></div> <div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 820px;"></div>	17/21
8) MICROFILM NUMBER	<div style="border: 1px solid black; width: 100px; height: 15px; margin-left: 690px;"></div>	22/27
9) VICTIM NUMBER	<div style="border: 1px solid black; width: 40px; height: 15px; margin-left: 790px;"></div>	28/29
10) DISPOSITION OF VICTIM	<div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 820px;"></div>	30
STUDY HOSPITAL NO.		
<u>134A OR 106D,S:</u>		
11) O.H.I.P. INSURANCE NUMBER	<div style="border: 1px solid black; width: 180px; height: 15px; margin-left: 635px;"></div>	31/38
12) SEX (MALE=1,FEMALE=2)	<div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 820px;"></div>	39
13) AGE (IF 100 + CODE AS99)	<div style="border: 1px solid black; width: 40px; height: 15px; margin-left: 790px;"></div>	40/41
14) DIAGNOSIS/REASON FOR SERVICE	B. <div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 770px;"></div> S. <div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 810px;"></div> A. <div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 740px;"></div> I. <div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 810px;"></div>	42/43
15) HOSPITAL NUMBER	<div style="border: 1px solid black; width: 80px; height: 15px; margin-left: 735px;"></div>	44/47
16) TOTAL DAYS	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	48/50
17) SUPP. DAYS	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	51/53
IF TRANSFERRED TO ANOTHER HOSPITAL FOR ACTIVE TREATMENT,		
RECORD HOSPITAL/LOCATION		
18) "FOLLOW-UP" HOSPITAL NUMBER	<div style="border: 1px solid black; width: 100px; height: 15px; margin-left: 735px;"></div>	54/57
19) TOTAL DAYS	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	58/60
20) SUPP. DAYS	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	61/63
<u>134B AND 151:</u>		
21) TOTAL NUMBER OF VISITS ON 134B	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	64/66
22) TOTAL NUMBER OF VISITS ON 151	<div style="border: 1px solid black; width: 60px; height: 15px; margin-left: 765px;"></div>	67/69
<u>MEDICAL FEES:</u>		
23) SUM OF PAYMENT FOR THE PERIOD OF TREATMENT	<div style="border: 1px solid black; width: 150px; height: 15px; margin-left: 655px;"></div>	70/76
24) FATALITY	<div style="border: 1px solid black; width: 20px; height: 15px; margin-left: 810px;"></div>	77

STANDARD WARD RATES FOR HOSPITALS
IN THE MVAI STUDY

<u>Hospital Centre</u>	<u>Study Hospital</u>	<u>MNS#</u>	<u>1975 Rate</u>	<u>1976 Rate</u>
London	St. Joseph's	1497	\$121.40	\$140.64
	Victoria	1502	145.13 ⁽³⁾	168.30
	University	1500	183.85	211.88
Kitchener	Kitchener-Waterloo	1917	109.14	123.86
	St. Mary's General	1921	92.45	106.09
Peterborough	Peterborough Civic	1768	97.78	109.90
	St. Joseph's General	1772	97.18	109.61
Kingston	Hotel Dieu	1097	128.91	156.50
	Kingston General	1100	142.51	168.64
Sudbury	St. Joseph's ⁽¹⁾	2163	107.49	-
	Sudbury General	2169	101.70	117.89
	Sudbury Memorial	2170	108.30	136.07
	Laurentian ⁽²⁾	2159	202.91	152.70
Thunder Bay	The General Hospital of Port Arthur	2187	94.07	117.16
	St. Joseph's General	2196	93.73	118.80
	McKellar General	2191	87.41	110.24 ⁽⁴⁾

(1) St. Joseph's in Sudbury was closed June 1975.

(2) Laurentian in Sudbury was opened June 1975.

(3) Final settlement rate was \$147.40.

(4) Final settlement rate was \$111.32.

